

## CONCEPTS TO SUPPORT HRP INTEGRATION USING PUBLICATIONS AND MODELING

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Initial efforts are underway to enhance the Human Research Program (HRP)'s identification and support of potential cross-disciplinary scientific collaborations. To increase the emphasis on integration in HRP's science portfolio management, concepts are being explored through the development of a set of tools. These tools are intended to enable modeling, analysis, and visualization of the state of the human system in the spaceflight environment; HRP's current understanding of that state with an indication of uncertainties; and how that state changes due to HRP programmatic progress and design reference mission definitions.

In this talk, we will discuss proof-of-concept work performed using a subset of publications captured in the HRP publications database. The publications were tagged in the database with words representing factors influencing health and performance in spaceflight, as well as with words representing the risks HRP research is reducing. Analysis was performed on the publication tag data to identify relationships between factors and between risks. Network representations were then created as one type of visualization of these relationships. This enables future analyses of the structure of the networks based on results from network theory. Such analyses can provide insights into HRP's current human system knowledge state as informed by the publication data. The network structure analyses can also elucidate potential improvements by identifying network connections to establish or strengthen for maximized information flow.

The relationships identified in the publication data were subsequently used as inputs to a model captured in the Systems Modeling Language (SysML), which functions as a repository for relationship information to be gleaned from multiple sources. Example network visualization outputs from a simple SysML model were then also created to compare to the visualizations based on the publication data only.

We will also discuss ideas for building upon this proof-of-concept work to further support an integrated approach to human spaceflight risk reduction.